

Inadvertent vertebral vein catheterisation during transjugular vein cannulation: a rare complication

*Transjuguler ven kanülasyonu sırasında yanlışlıkla vertebral ven kateterizasyonu:
Nadir bir komplikasyon*

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Central venous cannulation through the right internal jugular vein, which is a widely used technique, may lead to complications at different stages, including catheter placement stage, indwelling stage and the removal stage. Malposition of the central venous catheter may also result in catastrophic consequences. In this article, we report 74-year-old male case with misplaced central venous catheter into the right vertebral vein in seventh vertebral foramen, which was detected at the catheter removal stage. *Key words:* Catheter malposition; complication; internal jugular vein catheterization; vertebral vein cannulation.

Central venous catheters are commonly utilized to gain vascular access for various clinical indications. Successful placement requires not only technical expertise, but also awareness of the potential complications.^[1,2] In this article, we report an inadvertent right vertebral vein catheterization which was recognized during the catheter removal stage. The diagnostic features and the consequences of this rare complication are discussed.

CASE REPORT

A 74-year-old Caucasian male with rectal carcinoma was admitted to our hospital for colorectal surgery. Following routine monitorization, induction, and intubation, the patient was prepared for right internal jugular vein catheterization, which was to be attempted

Sağ internal jugüler ven aracılığıyla santral venöz kanülasyon yaygın olarak kullanılan bir teknik olup, kateterin yerleştirilme aşaması, ilerletme aşaması ve çıkarılma aşaması gibi farklı aşamalarda komplikasyonlara yol açabilir. Santral venöz kateterin malpozisyonu, tehlikeli sonuçlara da yol açabilmektedir. Bu yazıda, kateterin çıkarılma aşamasında fark edilen, santral venöz kateterin yedinci vertebral foramen içerisindeki sağ vertebral vene yanlışlıkla yerleştirildiği 74 yaşında erkek bir olgu sunuldu. *Anahtar sözcükler:* Kateter malpozisyonu; komplikasyon; internal jugüler ven kateterizasyonu; vertebral ven kanülasyonu.

via the posterior approach using the landmark technique. A venous puncture was established on the first attempt, and a guidewire was threaded through a needle without difficulty after the dilatation of the skin and subcutaneous tissues with a 7 French (7F) introducer sheath catheter (Edwards Lifesciences Corporation, Irvine, CA, USA) that was inserted over the wire. The free return of venous blood was obtained via the catheter, and it was assumed that the catheter tip was inserted correctly in the superior vena cava (SVC). During the surgery, the catheter functioned well and was used for fluid infusion and central venous pressure measurements. At the end of the operation, the patient was taken to the intensive care unit (ICU). During follow-up, the patient suffered from mild right shoulder pain and numbness of the right hand. Initially,



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Figure 1. A scanogram of the patient shows the extraordinary route of the central venous catheter (white arrow).

we speculated that these symptoms might be related to a mild brachial plexus injury due to the position of the arm during surgery or an injury caused by the needle during the jugular venous access trial and expected them to resolve after a short period of time. However, on the first postoperative day, after deciding to remove the catheter, we felt an atypical resistance during the removal attempt and observed that the pain and numbness increased when we touched the catheter. We suspected malposition of the catheter and decided to visualize its position radiologically. A chest X-ray showed a deep, unusual route for the catheter but did not help us localize the exact position. A scanogram was then performed which revealed that the catheter was in the right vertebral vein (Figure 1). An axial computed tomography (CT) scan also showed the catheter in the same location (Figure 2).

A three-dimensional (3D) volume-rendered image showed that the catheter had punctured the vertebral vein in the seventh vertebral foramen and traveled downward to the brachiocephalic vein (Figure 3).

We discussed the possible complications of removal and decided to remove the catheter in a hybrid operating room equipped with fluoroscopy and ultrasound. In addition, a vascular surgeon would perform the surgery and an interventional radiologist would be present. After confirming the normal hemostatic parameters [prothrombin time (PT), partial thromboplastin time (PTT), and international normalized ratio (INR)], the patient was taken into operating room. The possibility of a controlled removal of the catheter by surgical exploration was kept as an alternative option in case of an unsuccessful removal attempt or non-self-limiting hemorrhage due to the potential risk of additional morbidities related to the surgery. Furthermore, radiological intervention was available in



Figure 2. An axial computed tomography scan shows the catheter in the right vertebral vein (white arrow).

case of hematoma formation, which would jeopardize vertebral artery circulation. When we tried to remove the catheter by simple traction, we felt strong resistance. We then gently inserted a guidewire through the



Figure 3. A three-dimensional volume-rendered image shows that the catheter punctured the vertebral vein in the seventh vertebral foramen (white arrow) and traveled downward to the brachiocephalic vein.

catheter and pulled, and the catheter and guidewire came out together. This entire process was visualized fluoroscopically. After this, we applied external compression over the surrounding tissues. During the procedure, we monitored the hemorrhage by observing the clinical signs and using the ultrasonography. No complications were seen afterwards, and the numbness and pain regressed as soon as the catheter was removed. Four days after the removal of the catheter, the patient was discharged, though a small amount of numbness remained in his right hand. At the end of the second week, the symptoms of the patient had completely resolved.

DISCUSSION

Malposition of central venous catheters has been reported at a rate ranging from 1-33% by different investigators.^[1,2] The most significant complications that can occur are internal carotid artery puncture, pneumothorax, vessel erosion, thrombosis, airway obstruction, malposition of the catheter, and infection, with the most common being internal carotid artery puncture.^[3] Muhm et al.,^[4] in their study of 2,104 patients who underwent central venous catheterization could only find one incident of a misdirected catheter in the smaller tributary. More recently, a few cases of vertebral artery injury via internal jugular venous catheterization have been reported, but to our knowledge, no cases involving vertebral vein cannulation exist in the literature.^[5-8]

The vertebral vein is a tributary of the brachiocephalic vein and is formed by the union of the branches that originate in the occipital region and form a plexus about the vertebral artery in its passage through the transverse foramen, which has been defined as an opening in the transverse processes of the cervical vertebrae. In the six upper vertebrae, the transverse foramen gives passage to the vertebral artery and vein as well as a plexus of sympathetic nerves. The seventh transverse foramen gives passage only to the vertebral vein or veins.

When the possibility of applying external compression exists, it is simple to manage the inadvertent venous misplacement of catheters by simply removing and applying compression over the puncture site. However, in our case, the puncture site of the vertebral vein was inside the transverse foramen of the seventh cervical vertebra, which was impossible to reach externally.

We believe that vertebral vein injury can cause hematoma, arteriovenous fistula formation, or venous infarction in draining tissues. Additionally, Winston et

al.^[9] reported a case of brachial plexopathy following the infusion of chemotherapeutic agents through the catheter which then migrated to the vertebral vein.

The posterior approach, landmark technique, and lack of experience of our resident might have all played separate roles in our case. Clinicians should be aware of the possibility of such an extraordinary malpositioning of the catheter in patients with symptoms of brachial plexus injury. Cases like ours also favor the use of ultrasound guidance in the cannulation of the internal jugular vein since it might prevent this rare complication.

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